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(71) Applicants and
(72) Inventors: **KOENE, Johan, Willem** [NL/NL]; Witmoesdijk 7, NL-7468 PS Enter (NL). **WESSELS, Fransiscus, Bernardus, Garlacus** [NL/NL]; Bouvigne 9, NL-7608 LP Almelo (NL).

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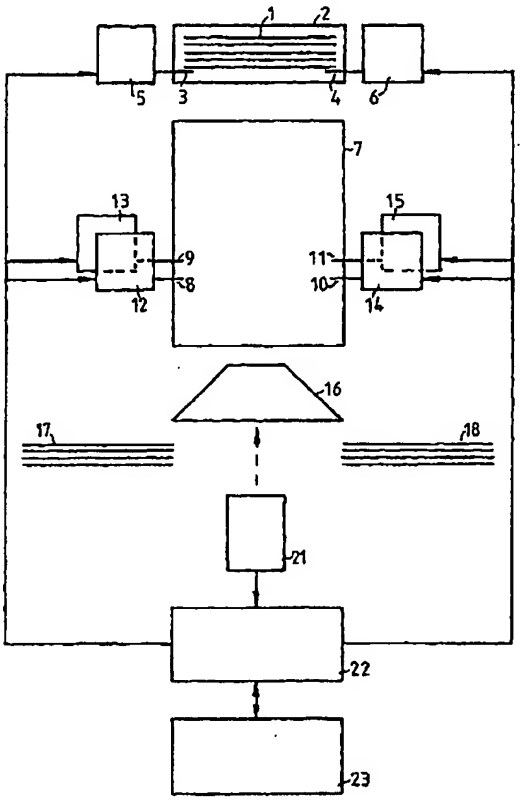
[Continued on next page]

(54) Title: SORTING APPARATUS



(57) Abstract: Sorting apparatus for sorting playing cards, comprising an input section, into which a deck of cards can be placed, and four output openings via which cards that have been sorted can leave the apparatus. In the sorting process, use is made of a TV camera and a computer, in such a way that a previously determined play can be dealt. Moreover, the apparatus may read and evaluate score cards, which have the same dimensions as playing cards.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Sorting apparatus

The invention relates to a sorting apparatus for sorting cards, comprising an input section, in which a deck of cards can be placed, and at least two output openings, through which sorted out cards may leave the apparatus.

Sorting apparatus of this kind are known. In a known apparatus, a transport means feeds the cards along a reading device and through a sorting device. During this operation, cards are easily damaged and there is a great chance that damaged or bent cards lead to a failure.

Starting point for the present invention is that a card should hardly be touched. According to an aspect of the invention it is therefore characterized in that the input section and the output openings are connected by a chute, in which sorting means are located.

A favourable embodiment according to another aspect of the invention, which enables the actual sorting process while touching a card only very little, is characterized in that the sorting means comprise four controllable blocking devices, and that further four actuators and steering means for steering the actuators are provided, in such a manner that always one edge of a card is obstructed while falling through the chute. As a result of this obstruction the card will tip over, which in turn will determine a direction in which the card will fall.

For a predictable steering of a card, it is preferred to obstruct an edge of a card over some length or on more than one place. A favourable embodiment that realizes this is characterized in that the blocking devices are positioned

near corners of the chute and that they are activated in pairs.

A favourable embodiment which results in a very predictable tipping over of the cards is characterized in that an activated blocking device shoots out from a corner of the chute in a downward sloping position, in such a way that two activated blocking devices in fact form a slide along which a card slides.

A favourable embodiment according to another aspect of the invention, which enables the sorting of slightly damaged and/or bent cards, is characterized in that a first side of the chute is provided with a single point of support and an opposite second side is provided with two points of support, for supporting the deck of cards.

A favourable embodiment according to another aspect of the invention is characterized in that de apparatus is provided with a first actuator, for pushing precisely one card off the single point of support and with a second actuator, for subsequently pushing the card from the two points of support. Operating the first and the second actuator shortly one after the other results in precisely one card falling down the chute in a substantially horizontal position.

A favourable embodiment according to a further aspect of the invention is characterized in that the apparatus is provided with camera means, connected with the steering means, for observing a card, positioned on the points of support. In this way, a card can be observed just prior to falling after which the steering means can steer the actuators, based upon the observation, such that the card is guided towards the desired output opening.

A favourable embodiment according to a further aspect of the invention is characterized in that the apparatus is provided with a four sided, pyramid shaped separation device, operationally positioned at the bottom of the chute, on the base of which the output openings are positioned. A card that is slightly tipped over by the actuators will slide then along one of the sides towards an output opening next to that side. In order to prevent the pyramid from blocking the view of the camera means, the pyramid may be made of a transparent material or it may consist of only the four ribs that can be made of metal wire or the apex may be missing.

A favourable embodiment according to a further aspect of the invention is characterized in that the steering means comprise a digital computer, arranged for guiding the cards towards the output openings according to a predefined method. This may mean that the cards are shuffled and dealt, but also that each player is given a predefined hand of cards, for example in order to play a computer guided game, in which the computer may give directions or make corrections.

A very favourable embodiment according to a further aspect of the invention is characterized in that the sorting apparatus is moreover arranged for reading and evaluating score cards and program cards, placed in the input opening. In this embodiment, score cards may be used of which the dimensions correspond with the dimensions of the playing cards, while the results of the game may be recorded by ringing symbols on the score cards with a common writing tool or by closing pre-printed partial rings. In the same way program cards may be used, the dimensions of which substantially correspond with the dimensions of the playing

cards, on which one may select a particular type of play by ringing a symbol on the program card.

The invention also relates to a score card or a program card, suitable to be used in a sorting apparatus according to the invention.

The invention also relates to a method for marking a score card or a program card, characterized in that the marking takes place by ringing symbols, printed on the score card or the program card with a writing tool. The advantage is that a ringed symbol can easily be detected by a program in the digital computer.

The invention also relates to a method for correcting a score card or a program card, characterized in that a previously made mark by ringing a symbol is nullified by substantially filling up the ring with a writing tool. As a ring is no longer present then, the program in the digital computer will not recognise a symbol thus corrected. For the user, the advantage is that he may perform a marking operation and a correction operation with a single writing tool, like a pencil or a pen.

It is also possible to place the result of a play in the input section, according to a fixed instruction. While playing the game of bridge, one may place the results of individual players for example in the order N,E,S,W in de input section. The computer may register then how the game has been played and may indicate where and by whom a mistake has been made. This can be used when replaying a play, chosen because of its educational value, which has been dealt by the computer as part of a course.

The invention will now be further explained with a reference to the following figures, in which:

Fig. 1 represents in a block diagram a possible embodiment of the apparatus;
Fig. 2 represents a possible embodiment of the apparatus in top view;
Fig. 3 represents a possible embodiment of the apparatus in a longitudinal cross section;
Fig. 4 represents a possible embodiment of a score card or a program card.

Fig. 1 represents in a block diagram a possible embodiment of the apparatus, in which a deck of cards 1 is placed in an input section 2, such that the cards rest on a single point of support 3 and a double point of support 4. Single point of support 3 can be controlled by an actuator 5 and next double point of support 4 by an actuator 6, after which precisely one card will fall down into a chute 7. Nearby the four corners of chute 7, four blocking means 8,9,10,11 are mounted, which can be controlled with actuators 12,13,14,15, such that always two blocking means are introduced into chute 7, such that a falling card will slightly tip over in a previously determined way. On the bottom of chute 7, a pyramid shaped device 16 placed, onto which a tipped over card will land and slide off to one of the four sides, onto a desired pile 17 or 18 or onto a pile 19 or 20, not visible in this figure.

Underneath pyramid shaped device 16 a camera 21 is placed, which always observes the lowest card of deck 1, thanks to the fact that the apex of pyramid shaped device 16 is missing. Camera 21 is connected to a computer 22, which is provided with software for recognizing cards. If a particular card is recognized, based upon images of all the

cards which are stored in computer 22 and based upon a correlation process which is known as such, then the actuators 5,6 are controlled by computer 22, causing the card to fall down into chute 7, and two of the four actuators 12,13,14,15 are controlled, as a result of which the card will land on one of the for example four piles which are formed on the foot of pyramid shaped device 16. Of course one may form two or three piles of cards in a completely analogous way.

Computer 22 is moreover provided with software for sorting the cards in a number of possible ways, for example pseudo-random or for dealing particular cards to particular players, based upon a library of educational significant plays which is present in computer 22. In that case a user of the sorting apparatus may indicate, with the aid of a control panel or with program cards that can be read by the sorting apparatus, in which manner the cards must be dealt.

Fig. 2 represents a possible embodiment of the apparatus in top view, with an input section 2 in which a deck of playing cards can be put and of which, for reasons of clarity the side walls are shown. Moreover, the single point of support 3 is shown, consisting of a metal pawl on which the lowest card rests. Over support point 3 a small metal plate 24 may slide (shown shaded), which metal plate 24 has a thickness that is less than the thickness of a playing card. Moreover, the double point of support 4 is shown, consisting of two metal plates which are positioned perpendicular to the drawing surface, which are provided with a slot, in which a metal plate 25 may slide (shown shaded), which metal plate 25 also has a thickness which is less that the thickness of a playing card. With the aid of actuator 5, metal plate 24 is moved into input section 2, such that the lowest playing card slides off single point

of support 3, while the opposite side of the playing card slides into the slots above double point of support 4, such that it substantially rests against metal plate 25. Next, metal plate 25 is moved towards input section 2 by actuator 6, which causes the card to fall into chute 7. By controlling actuator 6 shortly after actuator 5, one can obtain a card that falls in an almost horizontal position into chute 7. The position of the lowest card is only known at the points of support 3,4 with a high degree of precision. For that reason plate 24 is provided with a tip and plate 25 is provided with two tips, which slide over the points of support and which realize the actual contact with the cards.

Fig. 3 represents a possible embodiment of the apparatus in a longitudinal cross section, with input section 2 in which a deck of cards can be put and chute 7, in which the cards to be sorted fall down. Moreover, the single point of support 3 is shown consisting of a small metal pawl on which the lowest card of the deck rests. Over support point 3 the metal plate 24 may slide with the aid of actuator 5, in such a manner that the card will slide off single point of support 3 and at the same time will slide in a slot above support 4. In the slot, a metal plate 25 is positioned. Next, metal plate 25 is moved towards input section 2 by actuator 6, as a result of which the card falls into input section 2.

Before the actuators 5,6 are operated, the lowest card is observed by camera 21 with the aid of light, transmitted by illumination means 26a,26b, for example LED's or flash lamps which are synchronized with camera 21. Once the card is recognized by the computer and the decision has been made on which of the piles 17,18,19,20 the card should land, the actuators 5,6 are controlled and two of the four

actuators 12,13,14,15 are controlled, in such a way that two of the four blocking means 8,9,10,11 are introduced into chute 7, which causes the card to slightly tip over and next to land onto the pyramid shaped device on the bottom of chute 7 and to slide onto one of the four piles of cards 17,18,19,20 which are formed on the foot of the pyramid shaped device 16. Round the blocking means 8,9,10,11, longitudinally shaped holes are made in the sidewalls 27 of the apparatus. For reasons of clarity they have been left out in Fig. 3.

For the illumination means 26a,26b it is important that they do not flash into camera 21 due to reflections on a card, because this would hamper the recognition of a card. It is therefore advantageous to locate the illumination means such that they illuminate the card via reflections on a sidewall 27. These reflections tend to diffuse the light and it reduces the chance of reflection on a card. Of course it is also possible to locate the illumination means 26a,26b in the sidewalls.

Fig. 4 represents a possible embodiment of a score card or a program card 28, on which printed symbols 29 are present, which can be selected for representing a score or for programming a play. A symbol 30 is selected by ringing it with a pencil; for a symbol 31 the selection is nullified by substantially filling up the ring.

Claims

1. Sorting apparatus for sorting cards, comprising an input section, in which a deck of cards can be placed, and at least two output openings, through which sorted out cards may leave the apparatus, characterized in that the input section and the output openings are connected by a chute, in which sorting means are located.

2. Sorting apparatus according to claim 1, characterized in that the sorting means comprise four controllable blocking devices, and that further four actuators and steering means for steering the actuators are provided, in such a manner that always one edge of a card is obstructed while falling through the chute.

3. Sorting apparatus according to claim 2, characterized in that the blocking devices are positioned near corners of the chute and that they are activated in pairs.

4. Sorting apparatus according to claim 3, characterized in that an activated blocking device shoots out from a corner of the chute in a downward sloping position.

5. Sorting apparatus according to claim 1, characterized in that a first side of the chute is provided with a single point of support and an opposite second side is provided with two points of support, for supporting the deck of cards.

6. Sorting apparatus according to claim 5, characterized in that de apparatus is provided with a first actuator, for pushing precisely one card off the single point of support and with a second actuator, for subsequently pushing the card from the two points of support.

7. Sorting apparatus according to claim 2, characterized in that the apparatus is provided with camera means, connected with the steering means, for observing a card, positioned on the points of support.

8. Sorting apparatus according to claim 1, characterized in that the apparatus is provided with a four sided, pyramid shaped separation device, operationally positioned at the bottom of the chute, on the base of which the output openings are positioned.

9. Sorting apparatus according to claim 7, characterized in that the steering means comprise a digital computer, arranged for guiding the cards towards the output openings according to a predefined method.

10. Sorting apparatus according to claim 9, characterized in that the sorting apparatus is moreover arranged for reading and evaluating score cards and program cards, placed in the input opening.

11. Score card or program card, suitable to be used in an apparatus according to claim 10.

12. Method for marking a score card or a program card according to claim 11, characterized in that the marking takes place by ringing symbols, printed on the score card or the program card with a writing tool.

13. Method for correcting a score card or a program card according to claim 11, characterized in that a previously made mark by ringing a symbol is nullified by substantially filling up the ring with a writing tool.

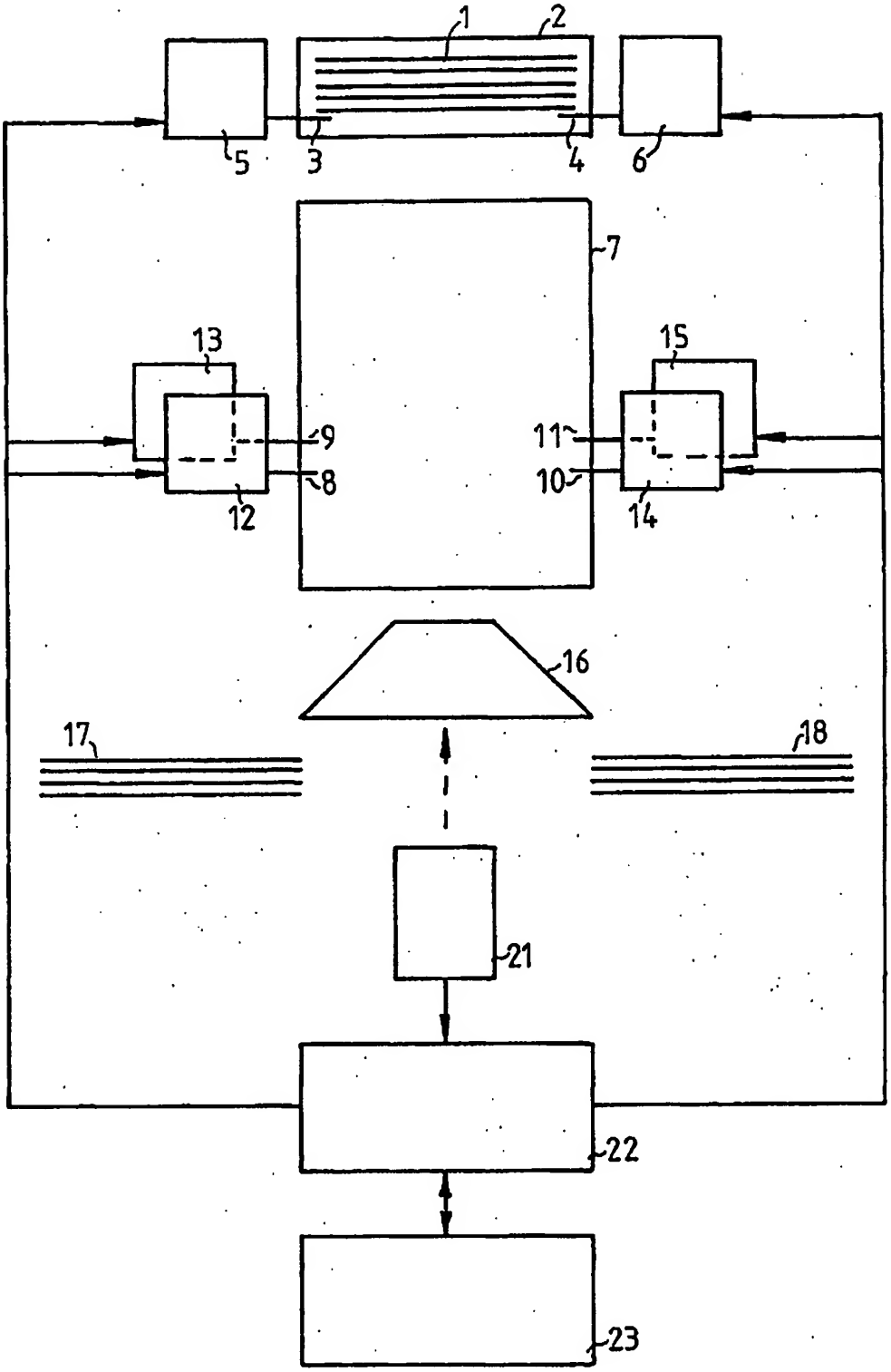

FIG.1

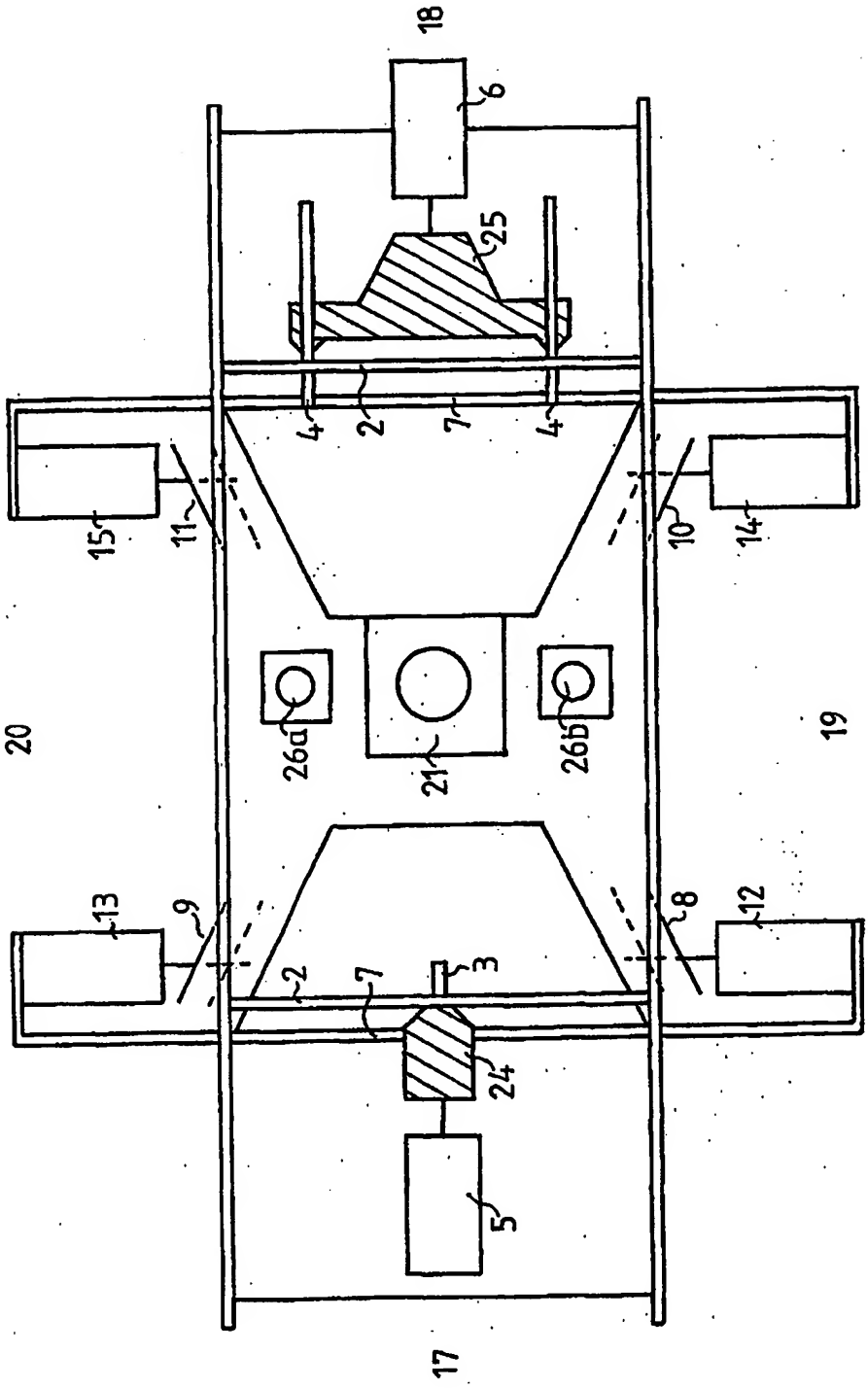

FIG.2

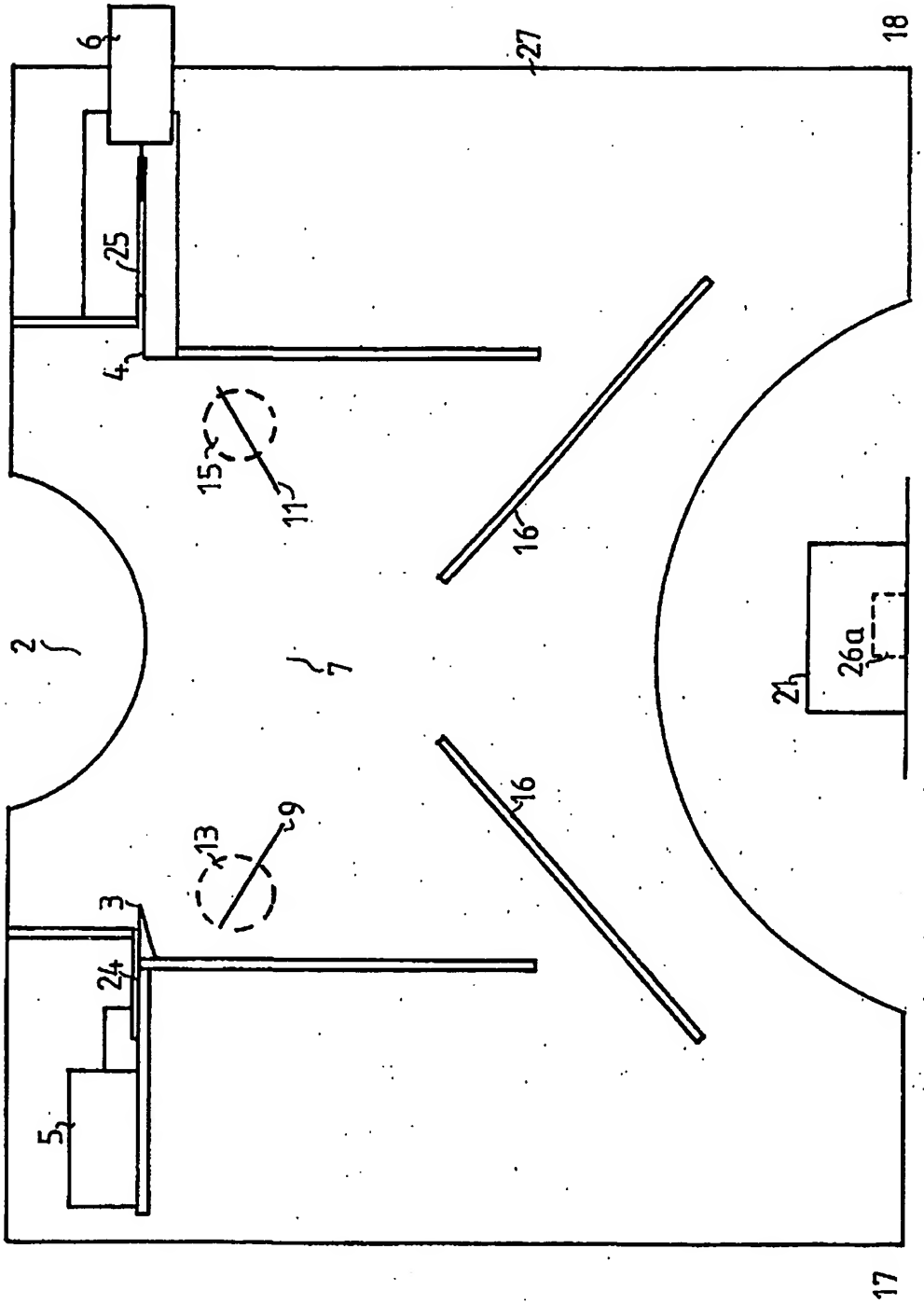

FIG.3

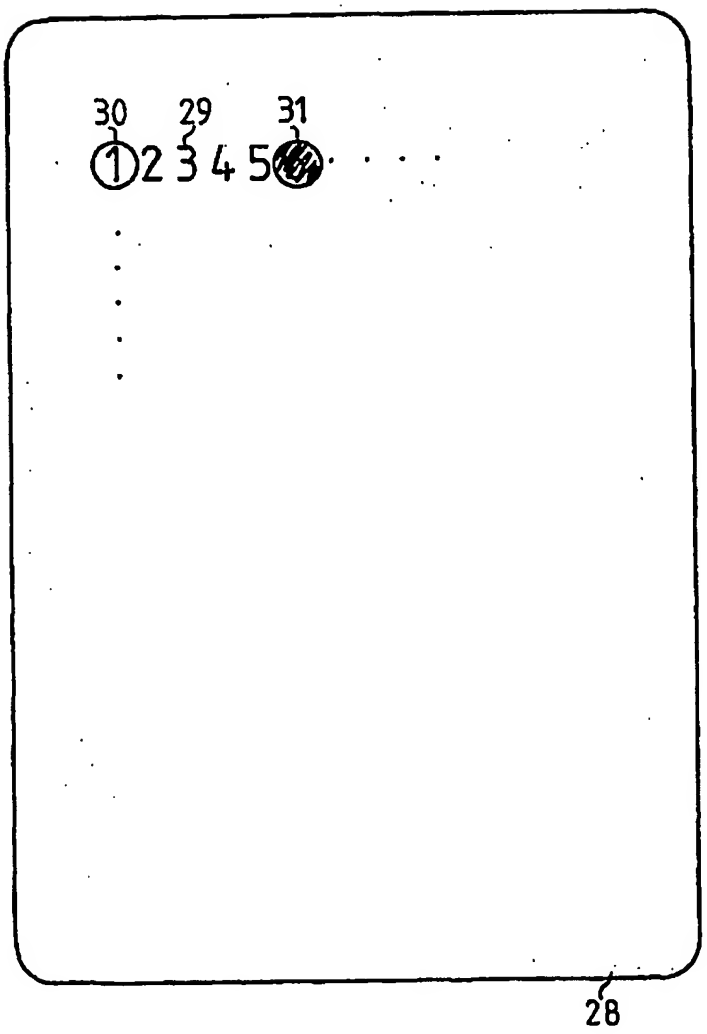

FIG.4.

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(71) Applicants and
(72) Inventors: **KOENE, Johan, Willem** [NL/NL]; Witmoesdijk 7, NL-7468 PS Enter (NL). **WESSELS, Fransiscus, Bernardus, Garlacus** [NL/NL]; Bouvigne 9, NL-7608 LP Almelo (NL).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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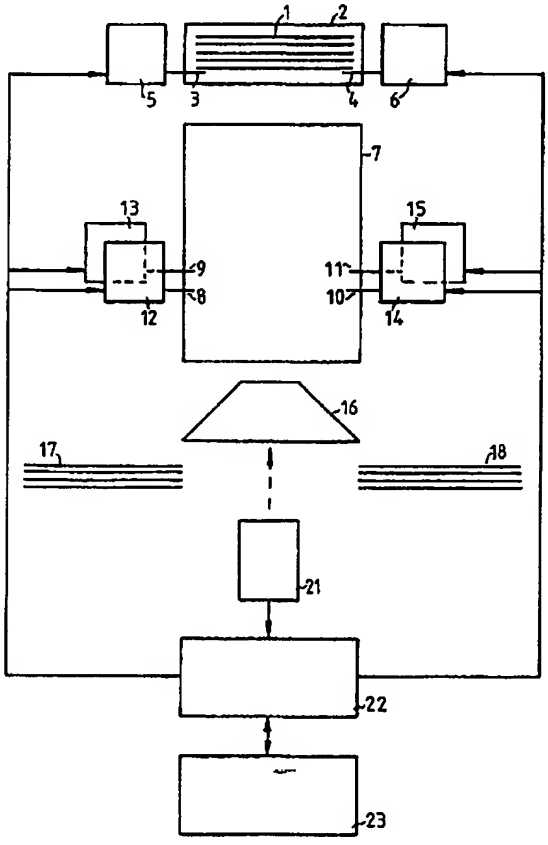
(54) Title: SORTING APPARATUS



(57) Abstract: Sorting apparatus for sorting playing cards, comprising an input section (2), into which a deck of cards (1) can be placed, and four output openings (17,18,19,20) via which cards that have been sorted can leave the apparatus. In the sorting process, use is made of a TV camera (21) and a computer (22), in such a way that a previously determined play can be dealt. Moreover, the apparatus may read and evaluate score cards, which have the same dimensions as playing cards.

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6 September 2002

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 01/00900

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A63F1/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A63F B07C G06F G06K G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 121 921 A (FRIEDMAN WILLARD ET AL) 16 June 1992 (1992-06-16) column 3, line 12 -column 6, line 51; figures	1,2

X	US 5 431 399 A (KELLEY KALON L) 11 July 1995 (1995-07-11) abstract column 4, line 35 - line 48; figures 2-5	1
A	column 7, line 54 - line 60	7
A	column 7, line 60 - line 63	9
A	column 3, line 21 - line 38	10

A	US 4 033 590 A (PIC FRANCOISE) 5 July 1977 (1977-07-05) column 4, line 21-23; figures 2,3,7,10 column 7, line 28-39	4-6

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 March 2002	06.06.02

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bagarry, D

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 01/00900

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	GB 2 357 752 A (PANTLIN DICK HURST) 4 July 2001 (2001-07-04) page 9, line 7 -page 11, line 23; figure 2	1-3,7,9

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NL 01/00900

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-10

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-10

   A sorting apparatus for sorting cards, with a chute, solving the problem of hardly touching the cards

2. Claim : 11

   A score card or program card

3. Claims: 12-13

   A method for marking/correcting a score card or a program card by ringing a symbol or filling up the ring of the symbol, with a single writing tool.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/NL 01/00900

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5121921	A	16-06-1992	NONE	
US 5431399	A	11-07-1995	NONE	
US 4033590	A	05-07-1977	NONE	
GB 2357752	A	04-07-2001	NONE	